Remarks

Claims 1-20 remain pending in the present application, of which claim 1 has been amended. It is respectfully submitted that the pending claims define allowable subject matter.

Claims 1-20 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Jackson (USP 6,673,017) alone or further in view of Yamauchi (USP 6,730,032) or Pang et al. (USP 6,558,325). Applicant respectfully traverses this rejection.

Claim 1 recites, among other things, "analyzing said periodic movement to determine a correction". Independent claim 8 recites, among other things, comparing intensity values of said at least one common point of interest between said adjacent subsets; and calculating an adjusted time interval for at least one of said adjacent subsets based on said intensity values. Independent claim 17 recites, among other things, said processor comparing adjacent volume subsets and calculating adjusted time intervals for at least one of said adjacent volume subsets.

Jackson does not teach or suggest analyzing or comparing periodic movement between volume subsets to determine a correction or adjusted time interval between volume subsets. Instead, Jackson uses at least two temporal indicator types to define physiologic cycles. A first indicator is used to determine a base physiologic cycle and a second, different indicator is used to determine a time correction between image frames. The image frames are divided into groups of frames associated with different cycles based on the base physiological cycle. Jackson compares frames within each cycle to the base physiological cycle. Jackson recites that "A temporal offset relative to a base physiological cycle is determined for each frame within each group of frames in act 34" (col. 4, lines 60-62) and that "The waveforms of each cycle are fitted to a waveform of the base physiological cycle." (col. 6, lines 52-54) Jackson further recites:

> "In one embodiment, a plurality of frames corresponding to a first or other cycle are set as the base physiological cycle. For example, about 40 frames are acquired during the first cardiac cycle. The temporal position of frames from other cycles is then determined as an offset from a corresponding or nearest frame from the base physiological cycle or first cycle." (col. 5, lines 50-57)

There is no suggestion to compare frames within adjacent cycles to one another, nor is there teaching or suggestion to derive a correction between the adjacent cycles based on the comparison.

Turning to Yamauchi, this reference states that "The cycle average calculating unit 203 obtains the pulsation cycle data from the interpolated data storing unit 202, and calculates an average of pulsation cycles included in the interpolation range." (col. 10, lines 25-28) Yamauchi also recites that "the time stamp interpolating unit 204 corrects time stamp values of the plurality of sets of image/calculation data in a manner that makes each pulsation cycle containing these time stamps equal to the average pulsation cycle calculated earlier." (col. 10, lines 32-37) (col. 11, lines 10-14) Therefore, a single average cycle is calculated, the calculated average pulsation cycle, then the remaining cycles are modified in order to combine each of them with the calculated average pulsation cycle.

Turning to Pang et al. (Pang), an average cycle period is found. Each of the cycles are then modified by adding or deleting frames to reach the number of frames of the average cycle period. The modification may be made by deleting frames, removing frames having a low velocity, or adding interpolated or repeated frames.

It is submitted that, independent claims 1, 8 and 17 are patentable over Jackson, Yamauchi and Pang, alone or in combination. Furthermore, Iinuma (USP 5,551,434), Ustuner et al. (USP 6,780,152), Urbano et al. (USP 5,976,088), and Clark (USP 6,139,500) fail to make up for the deficiencies of Jackson, Yamauchi and Pang as discussed above.

Iinuma recites the "the unified time to which the times of data acquisition at all the sampling points are to be unified is defined as the time at which data is acquired in the 1st scanning line." (col. 15, lines 43-45) Therefore, Iinuma selects a scanning line and matches the times of all the sampling points of all of the lines to the selected scanning line.

Ustuner et al. recites that "Temporally aligned cardiac images from different cardiac cycles are combined using spatial compounding, compound aperture, synthetic aperture, sequential focus or compounding images associated with different center frequencies. For temporal alignment, an ECG input 24 may be provided. (col. 7, lines 24-30) Ustuner does not teach or suggest comparing

adjacent subsets of volumes or frames to one another, or adjusting adjacent subsets of volumes or frames based on the comparison.

Urbano et al. is directed to changing the frame rate based on a change in the heart rate during the image acquisition, such as during a treadmill stress test. (col. 17, lines 23-27) Urbano et al. recited that "a frame rate lookup table is used to select the desired frame rate for the current portion of the cycle" (col. 17, lines 49-51) and "FIG. 18 shows another table that may be used to determine the frame rate based on the heart rate." (col. 17, lines 63-64) Thus, Urbana et al. does not teach or suggest comparing adjacent subsets to one another.

Clark recites that "Since the ECG trigger times are recorded in the ADT algorithm for aliasing the data into the equivalent-time cardiac cycle, it is possible to compensate for slight cardiac cycle time variations by slight time rescaling." (col. 10, lines 25-28) Clark relies on ECG trigger data, and does not compare adjacent subsets of volumes to one another.

Claims 2-7, 9-16, and 18-20 ultimately depend from one of claims 1, 8 and 17, and are patentable over Jackson, Yamauchi and Pang for at least the reasons given above. Moreover, claims 10-14 recite features that further distinguish over Jackson, Yamauchi and Pang.

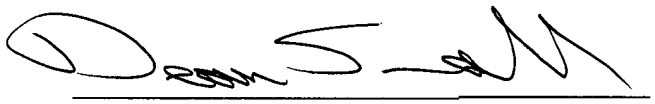
Claim 10 depends from claim 8 and recites "calculating cross correlations of said intensity values of said at least one common point; and identifying a maximum on each said cross correlations, said maximum characterizing a correction at which said intensity values best match between said adjacent subsets." Claims 13 and 14 each depend from claim 8 and recite "calculating cross correlations of said intensity values between said adjacent subsets." Jackson, Yamauchi and Pang do not calculate cross correlations of intensity values between adjacent subsets.

Claim 11 depends from claim 8 and recites "comparing first and second adjacent subsets; and said calculating step further comprising calculating said adjusted time intervals for said first adjacent subset through N adjacent subset based on said intensity values." Claim 12 depends from claim 8 and recites "comparing said second adjacent subset and a third adjacent subset; and said calculating step further comprising calculating said adjusted time intervals for said second adjacent subset through N adjacent subset based on said intensity values." Jackson, Yamauchi

and Pang do not compare any adjacent subsets and do not adjust the time intervals for the compared adjacent subsets through N adjacent subsets.

In view of the foregoing amendments and remarks, it is respectfully submitted that the prior art fails to teach or suggest the claimed invention and all of the pending claims in this application are believed to be in condition for allowance. Reconsideration and favorable action is respectfully solicited. Should anything remain in order to place the present application in condition for allowance, the Examiner is kindly invited to contact the undersigned at the telephone number listed below.

Respectfully Submitted,



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